Notice No. 6

Rules and Regulations for the Classification of Offshore Units, July 2014

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Issue date: June 2015

Amendments to	Effective date
Part 4, Chapter 1, Section 6	1 July 2015
Part 4, Chapter 2, Section 2	1 July 2015
Part 4, Chapter 3, Sections 3 & 6 (New)	1 July 2015
Part 4, Chapter 5, Section 5	1 July 2015
Part 4, Chapter 6, Sections 1, 5 & 7	1 July 2015
Part 4, Chapter 6, Section 3	Corrigenda
Part 4, Chapter 8, Sections 2 & 6	1 July 2015

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Part 4, Chapter 1

General

Effective date 1 July 2015

■ *Section 6*
Inspection, workmanship and testing

6.1 General

6.1.1 Requirements regarding inspection, workmanship and testing are given in ~~Pt 3, Ch 1,8~~ Pt 4, Ch 3,6 ~~of the Rules for Ships~~ and Ch 13,2 of the Rules for Materials and should be complied with. For ship units, testing load heights are to be in accordance with Pt 10, Ch 2,2.3.

Part 4, Chapter 2

Materials

Effective date 1 July 2015

■ *Section 2*
Structural categories

2.2 Column-stabilised and tension-leg units

2.2.1 In general, the structural members of column-stabilised and tension-leg units are to be grouped into the following structural categories:

(a) **Special structure**:
- (i) The plating of decks, heavy flanges, shell boundaries and bulkheads of the upper hull or platform which form 'box' or '**I**' type supporting structure in way of critical load transfer points and which receive major concentrated loads.
- (ii) The shell plating in way of the intersections of vertical columns with platform decks and upper and lower hulls.
- (iii) End connections and major intersections of primary bracing members.
- (iv) Critical load transfer by 'through' material used at connections of vertical columns, upper platform decks and upper or lower hulls which are designed to provide proper alignment and adequate load transfer.
- (v) External brackets, portions of bulkheads, flats, and frames which are designed to receive concentrated loads at Intersections of major structural members.
- (vi) Structure supporting concentrated mooring loads.

(b) **Primary structure**:
- (i) The plating of decks, heavy flanges, shell boundaries and bulkheads of the upper hull or platform which form 'box' or '**I**' type supporting structure except where the structure is considered as special application.
- (ii) The shell plating of vertical columns, lower and upper hulls, and diagonal and horizontal braces.
- (iii) Bulkheads, flats or decks, stiffeners and girders which provide local reinforcement or continuity of structure in way of intersections, except areas where the structure is considered as special application.
- (iv) Main support structure to cantilevered helicopter decks and lifeboat platforms.
- (v) Heavy substructures and equipment supports, e.g.~~,~~ drillfloor substructure, crane pedestals, anchor line fairleads and their supporting structure, *see also* 2.1.3.
- (vi) Riser support structure.
- (vii) Deck cantilevers
- (viii) Towing brackets

(c) **Secondary structure**:
- (i) Upper platform decks or decks of upper hulls, except areas where the structure is considered as primary or special application.
- (ii) Bulkheads, stiffeners, flats, decks, girders and web frames in vertical columns, upper and lower hulls, diagonal and horizontal bracing, which are not considered as primary or special application.
- (iii) Helicopter platforms and deckhouses.
- (iv) Lifeboat platforms.

2.3 Self-elevating units

2.3.1 In general, the structural members of self-elevating units are to be grouped into the following categories:

(a) **Special structure**:
- (i) Vertical columns in way of intersections with the mat structure.
- (ii) Intersections of lattice type leg structures which incorporate novel construction, including the use of steel castings.
- (iii) Leg to spudcan connections.
- (iv) Jack-house and/or bulkheads supporting locking.

(b) **Primary structure**:
- (i) The plating of bulkheads, decks and shell boundaries of the main hull or platform which in combination form 'box' or '**I**' type main supporting structure.
- (ii) External plating of cylindrical legs.
- (iii) Plating of all components of lattice type legs.
- (iv) Jack-house supporting structure.
- (v) External shell plating of footings and mats and structural components which receive initial transfer of loads from the leg structures.
- (vi) Internal bulkheads and girders of supporting structure of footings and mats which are designed to distribute major concentrated or uniform loads into the structure.
- (vii) Main support structure to cantilevered helicopter decks and lifeboat platforms.
- (viii) Heavy substructures and equipment supports, e.g.~~,~~ drillfloor substructure, drilling cantilevers, supports for raw water towers and crane pedestals, *see also* 2.1.3.
- (ix) Towing brackets.

(c) **Secondary structure**:
- (i) Deck and shell boundaries of the main hull or platform, except where the structure is considered as primary application.
- (ii) Internal bulkheads, decks stiffeners and girders of the main hull structure, except where the structure is considered as primary structure.
- (iii) Internal diaphragms, girders or stiffeners in cylindrical legs.
- (iv) Internal bulkheads, stiffeners and girders of footings and bottom mat supporting structures, except where the structure is considered primary or special application.
- (v) Helicopter platforms and deckhouses.
- (vi) Lifeboat platforms and walkways.

2.4 Ship units and other surface type units

2.4.1 Material classes and steel grades for individual areas of the hull structure of ship and barge type units are to comply with Pt 3, Ch 2,2 of the Rules for Ships.

2.4.2 Where the minimum design temperature, *see* 3.1, for exposed structure is –5°C or below, or for structural components not addressed by 2.4.1, the requirement of 2.4.3 should be complied with and the steel grades should be assigned in accordance with Table 2.4.1.

2.4.3 In general, the structure of ship units and other surfaces type units is to be grouped into the following structural categories:

(a) **Special structure**:
- (i) Structure in way of critical load transfer points which are designed to receive major concentrated loads in way of mooring systems, including yokes and similar structures, and supports to hawsers to mooring installations including external hinges, complex padeyes, brackets and supporting structures.
- (ii) Sheerstrake or rounded gunwale.
- (iii) Stringer plate at strength deck.
- (iv) Deck strake at longitudinal bulkheads.
- (v) Bilge strake.
- (vi) Continuous longitudinal hatch coamings.

(b) **Primary structure**:
- (i) Strength deck and raised quarter deck plating except where categorised ‘**special**’.
- (ii) Bottom shell plating of the main hull except where categorised ‘**special**’.
- (iii) Bulkhead plating in way of moonpools, drilling wells and circumturret.
- (iv) Upper strake in longitudinal bulkheads.
- (v) Continuous longitudinal members above strength deck except where categorised ‘**special**’.
- (vi) Vertical strake (hatch side girder) and upper sloped strake in top wing tanks.
- (vii) Main support structure to cantilevered helicopter decks and lifeboat platforms.
- (viii) Heavy substructures and equipment supports, e.g. integrated support stools to process plant, drill floor substructure, crane pedestals, anchor line fairleads and chain stoppers for positional mooring systems and their supporting structures, *see also* 2.1.3.
- (ix) Riser support structures.
- (x) Turret bearing support structure.
- (xi) Swivel stack support structure.
- (xii) Supporting structures to external turret.
- (xiii) Deck cantilevers

(xiv) Towing brackets

(c) **Secondary structure**:

(i) Bulkhead plating, side shell, longitudinals, stiffeners, deck plating including poop deck and forecastle deck, flats, girders and web frames, etc., except where the structure is categorised as **special** or **primary** structure. For topside plant supporting structures, *see also* 2.1.3.

(ii) Helicopter platforms and deckhouses.

(iii) Lifeboat platforms, walkways, guard rails, minor fittings and attachments, etc.

2.5 Buoys, deep draught caissons, turrets and miscellaneous structures

2.5.1 In general, the structure of buoys, deep draught caissons, turrets, and other miscellaneous structures included in Pt 3, Ch 13 is to be grouped into the following structural categories:

(a) **Special structure**:

(i) Structure in way of critical load transfer points which are designed to receive major concentrated loads including external brackets, portions of bulkheads, flats and frames.

(ii) Intersections of structures which incorporate novel construction including the use of steel castings.

(iii) Complex padeyes.

(iv) Highly stressed structural elements of anchor-line attachments.

(v) Bearings and structure at the base of mooring towers.

(b) **Primary structure**: The following structural members are categorised as primary, except when the structure is considered as special application:

(i) External shell plating of buoys, deep draught caissons, turrets and subsea modules.

(ii) Strength decks of buoys and deep draught caissons.

(iii) Truss structure supporting decks on deep draught caissons.

(iv) Miscellaneous structures:

- Support stools to process plant.
- Bearing support structure.
- Swivel stack support structure.
- Turntable construction.
- Chain tables.
- Riser support structure.
- Hawser support structure.
- Yoke and mooring arm construction.
- Mooring towers.

(v) Main support structures to cantilevered helideck and lifeboat platforms.

(vi) Heavy substructures and equipment supports, e.g., crane pedestals, anchor line fairleads for positional moorings, chain stoppers and their supporting structures.

(vii) Boundary bulkheads of moonpools.

(viii) Towing brackets

(c) **Secondary structure**:

(i) Bulkheads, stiffeners, decks, flats, etc., except where the structure is categorised as Special or Primary structure. For topside structures, *see also* 2.1.3.

(ii) Helicopter platforms and deckhouses.

(iii) Lifeboat platforms, walkways, guard rails and minor fittings and attachments, etc.

Part 4, Chapter 3

Structural Design

Effective date 1 July 2015

■ *Section 3*
Structural idealisation

3.1 General

3.1.1 In general, the special and primary structure of a unit is to be analysed by a three-dimensional finite plate element method. Only if it can be demonstrated that other methods are adequate will they be considered.

■ *Section 6*
Procedures for testing tanks and tight boundaries

6.1 General

6.1.1 The test procedures detailed in this Section are to be used to confirm the watertightness of tanks and watertight boundaries, the structural adequacy of tanks and weathertightness of structures.

6.2 Application

6.2.1 The testing requirements for gravity tanks, defined as tanks subject to a vapour pressure not greater than 70 kN/m^2, and other boundaries required to be watertight or weathertight, are to be tested in accordance with this Section. Tests are to be carried out in the presence of a Surveyor at a stage sufficiently close to completion such that the strength and tightness are not subsequently impaired and prior to any ceiling and cement work being applied over joints.

6.2.2 The testing of structures not listed in this Section are to be specially considered.

6.3 Test types

6.3.1 The types of test specified in this Section are:

(a) **Structural test:** which is to be conducted to verify the tightness and structural adequacy of the construction of tanks. This may be a hydrostatic test or, where the situation warrants, a hydropneumatic test.

(b) **Leak test:** which is to be used to verify the tightness of a boundary. Unless a specific test is indicated, this may be a hydrostatic, hydropneumatic test, air or other medium test.

6.4 Structural test procedures

6.4.1 Where a structural test is specified in Table 1.9.1, unless specified otherwise, a hydrostatic test is to be carried out in accordance with 9.6.1. Where practical limitations prevent a hydrostatic test being carried out, a hydropneumatic test in accordance with 9.6.2 is to be conducted.

6.4.2 A hydrostatic test may be carried out afloat to confirm the structural adequacy of tanks, provided a leak test is carried out beforehand and the results are confirmed as satisfactory.

6.4.3 For tanks of the same structural design, configuration and the same general workmanship, as determined by the attending Surveyor, a structural test may be carried out on only one tank, provided all subsequent tanks are tested for leaks by an air test.

6.4.4 Where the structural adequacy of a tank has been verified by structural testing on a previous vessel in a series, tanks of structural similarity on subsequent vessels within that series may be exempt from such testing, provided that the watertightness of all exempt tanks is verified by leak tests and thorough inspection. For sister ships built several years after the last ship in a series, such exemptions may be reconsidered. However, structural testing is to be carried out for at least one tank on each vessel in the series in order to verify structural fabrication adequacy. The relaxation to accept leak testing and thorough inspections instead of a structural test on subsequent vessels in a series does not apply to cargo space boundaries and tanks for segregated cargoes or pollutants.

6.4.5 Tanks exempted from structural testing in 9.4.3 and 9.4.4 may require structural testing if found necessary after the structural testing of the first tank.

6.4.6 For watertight boundaries of spaces other than tanks, excluding chain lockers, structural testing may be exempted, provided that the watertightness in all boundaries of exempted spaces are verified by leak tests and thorough inspection.

6.4.7 Consideration is to be given to the selection of tanks to be structurally tested. Selected tanks should be chosen so that all representative structural members are tested for the expected tension and compression.

6.5 Leak test procedures

6.5.1 Where a leak test is specified in Table 1.9.1, unless specified otherwise, a tank air test, compressed air fillet weld test, or vacuum box test is to be carried out in accordance with the applicable requirements of 6.6.4 to 6.6.6. A hydrostatic or hydropneumatic test conducted in accordance with the applicable requirements of 6.6.1 and 6.6.2 will be accepted as a leak test.

6.5.2 A hose test will be accepted as means of verifying the tightness of joints only in specific locations, identified in Table 1.9.1.

6.5.3 Air tests of joints may be conducted at any stage during construction provided that all work that might affect the tightness of the joint is completed before the test is carried out.

6.6 Definitions and details of tests

6.6.1 **Hydrostatic test** is a test conducted by filling a space with a liquid to a specified head. Unless another liquid is approved, the hydrostatic test is to consist of filling a space with either fresh or sea-water, whichever is appropriate for the space being tested, to the level specified in Table 1.9.1. For tanks intended to carry cargoes of a higher density than the test liquid, the head of the liquid is to be specially considered.

6.6.2 **Hydropneumatic test** is a combination of a hydrostatic test and a tank air test, consisting of partially filling a tank with water and conducting a tank air test on the unfilled portion of the tank. A hydropneumatic test, where approved, is to be such that the test condition in conjunction with the approved liquid level and air pressure will simulate the actual loading as far as practicable. The requirements for tank air testing shown in 6.6.4 are to be adhered to.

6.6.3 **Hose test** is a test used to verify the tightness of joints with a jet of water. It is to be carried out with the pressure in the hose nozzle maintained at not less than 2,0 bar during the test. The hose nozzle is to have a minimum inside diameter of 12 mm and is to be situated no further than 1,5 m from the joint. Where a hose test is not practical because of possible damage to machinery, electrical equipment insulation or outfitting items, it may be replaced by a careful visual examination of welded connections, supported by an ultrasonic or penetration leak test, or an equivalent, *see* SOLAS Reg. II-1/11.1.

6.6.4 **Tank air test** is to be used to verify the tightness of a compartment by means of an air pressure differential and leak detection solution. An efficient indicating solution (e.g. soapy water) is to be applied to the weld or penetration being tested and is to be examined whilst an air pressure differential of not less than 0,15 bar is applied by pumping air into the compartment. It is recommended that the air pressure in the tank be raised to and maintained at 0,20 bar above atmospheric pressure for one hour, with a minimum number of personnel in the vicinity of the tank, before being lowered to 0,15 bar above atmospheric pressure. Arrangements are to be made to ensure that any increase in air pressure does not exceed 0,30 bar. A U-tube with a height sufficient to hold a head of water corresponding to the required test pressure is to be used for verification and to avoid overpressure. The cross-sectional area of the Utube is not to be less than that of the pipe supplying air to the tank. In addition, the test pressure is to be verified by means of a pressure gauge, or alternative equivalent system. All boundary welds, erection joints and penetrations including pipe connections in the compartment are to be examined.

6.6.5 **Compressed air fillet weld test**. This test consists of compressed air being injected into one end of a fillet welded joint and the pressure verified at the other end of the joint by a pressure gauge on the opposite side. Pressure gauges are to be arranged so that an air pressure of at least 0,15 bar above atmospheric pressure can be verified at each end of all passages within the portion being tested. A leak indicator solution is to be applied and the weld line examined for leaks. A compressed air test may be carried out for partial penetration welds where the root face is greater than 6 mm.

6.6.6 **Vacuum box test** is a test used to verify the tightness of joints by means of a localised air pressure differential and indicator solution. The test is to be conducted with the use of a box with air connections, gauges and an inspection window that is to be placed over the joint being tested with a leak indicator solution applied. Air within the box is to be removed by an ejector to create a reduction in pressure. The pressure inside the box during the test is to be maintained between 0,20 to 0,26 bar.

6.6.7 **Ultrasonic test** may be used where a hose test is not practical to verify the tightness of a boundary, *see* 6.6.3. An arrangement of ultrasonic echo transmitters is to be placed inside a compartment and a receiver outside. The receiver is to be used to detect any leaks in the compartment.

6.6.8 **Penetration test** may be used where a hose test is not practical to assess butt welds, *see* 9.6.3, by applying a low surface tension liquid to one side of a compartment boundary. When no liquid is detected on the opposite side of the boundary after expiration of a definite time, the verification of tightness of the compartment's boundary may be assumed.

6.6.9 Other methods of testing may be considered and are to be agreed by LR prior to commencement of testing.

6.7 Application of coating

6.7.1 A final coating may be applied over automatic butt welds before the completion of a leak test, provided that careful visual inspections show continuous uniform weld profile shape, free from repairs, and the results of selected NDE testing show no significant defects. For all other joints, the final coating is to be applied after the completion of a leak test. The Surveyor reserves the right to require a leak test prior to the application of the final coating over automatic erection butt welds.

6.7.2 Any temporary coating which may conceal defects or leaks is to be applied at a time as specified for the final coating, *see* 6.7.1. This requirement does not apply to shop primer.

6.8 Safe access to joints

6.8.1 For leak tests, safe access to all joints under examination is to be provided.

Table 3.4.3 Testing requirements

Item to be tested	Testing procedure	Test requirement
Double bottom tanks, *see* Note 1	Leak & structural	The greater of: • head of water up to the top of the overflow • head of water 2,4 m above top of tank, *see* Note 2 • head of water up to bulkhead deck
Combined double bottom and hopper side tanks	Leak & structural	The greater of: • head of water up to the top of the overflow • head of water representing the maximum pressure experienced in service
Double bottom voids, *see* Note 3	Leak	
Double side tanks	Leak & structural	The greater of: • head of water up to the top of the overflow • head of water 2,4 m above top of tank, *see* Note 2 • head of water up to bulkhead deck
Combined double bottom, lower hopper and topside tanks	Leak & structural	
Topside tanks	Leak & structural	
Double side voids	Leak	
Deep tanks (other than those listed	Leak & structural	The greater of: • head of water up to the top of the overflow • head of water 2,4 m above top of tank, *see* Note 2
Cargo oil tanks, and fuel oil bunkers	Leak & structural	The greater of: • head of water up to the top of the overflow • head of water 2,4 m above top of tank, *see* Note 2 • head of water up to top of tank, *see* Note 2, plus setting of fitted pressure-relief valve
Scupper and discharge pipes in way of tanks	Leak & structural	
Ballast hold of bulk carriers	Leak & structural	The greater of: • head of water up to the top of the overflow • head of water up to the top of cargo hatch coaming
Peak tanks, *see* Note 4	Leak & structural	The greater of: • head of water up to the top of the overflow • head of water 2,4 m above top of tank, *see* Note 2
Fore peak voids	Leak	
Aft peak voids, *see* Note 4	Leak	
Cofferdams	Leak	
Watertight bulkheads	Leak	*See* Note 5
Superstructure end bulkhead	Leak	
Watertight doors below freeboard or bulkhead deck	Leak	*See* Notes 5 & 6
Double plate rudder blade	Leak	
Shaft tunnel clear of deep tanks	Leak	*See* Note 5
Shell doors when fitted in place	Leak	*See* Notes 5 & 7
Weathertight hatch covers and closing appliances	Leak	*See* Note 5
Steel hatch covers fitted to the cargo oil tanks and cargo holds of ships used for the alternate carriage of oil cargo and dry bulk cargo	Leak	*See* Note
Chain locker	Leak & structural	Head of water up to top of chain pipe
Independent tanks, and edible liquid tanks	Leak & structural	The greater of: • head of water up to the top of the overflow • head of water 0,9 m above top of tank, *see* Note 2
Ballast ducts	Leak & structural	The greater of: • ballast pump maximum pressure • setting of pressure-relief valve
Chemical tanker cargo tanks	Leak & structural	The greater of: • head of water 2,4 m above top of tank, *see* Note 2 • head of water up to top of tank, *see* Note 2, plus setting of fitted pressure-relief valve

NOTES
1. Including tanks arranged in accordance with the provisions of SOLAS Reg. II-1/9/4.
2. Top of tank is the deck forming the top of the tank, excluding any hatchways. In holds for liquid cargo or ballast with large hatch openings, the top of tank is to be taken to the top of the hatch.
3. Including duct keels and dry compartments arranged in accordance with the provisions of SOLAS Reg. II-1/9.4.
4. Testing of the aft peak is to be carried out after the sterntube has been fitted.
5. A hose test will be considered, *see* 6.5.2 and 6.6.3.
6. Watertight doors not confirmed watertight by a prototype test are to be subject to a hydrostatic test, *see* SOLAS Reg. II-1/16.2.
7. For shell doors providing watertight closure, watertightness is to be demonstrated through prototype testing before installation. The testing procedure is to be agreed with LR prior to testing.
8. Other testing methods listed in 6.6.7 and 6.6.8 may be considered, subject to adequacy of such testing methods being verified, *see* SOLAS Reg. II-1/11.

Part 4, Chapter 5

Primary Hull Strength

Effective date 1 July 2015

■ *Section 5* Fatigue design

5.3 Fatigue damage calculations

5.3.6 Where wave scatter diagrams are used for the calculation of fatigue damage for mobile offshore units and transit voyages of floating offshore installations at a fixed location, the scatter diagram is to contain at least one year of data.

Part 4, Chapter 6

Local Strength

Effective date 1 July 2015

■ *Section 1* General requirements

1.1 General

1.1.6 The connections to anchor points as defined in Pt 3, Ch 10,~~10~~ 6.1.4 and the structure in way of fairleads, chainstoppers, winches, etc.~~,~~ forming part of anchoring or positional mooring systems are to be designed for a working load equal to the breaking strength of the mooring or anchoring lines as applicable, *see* also Pt 3, Ch 10,11. Permissible stresses are to be in accordance with Ch 5,2.1.1(c). Special consideration will be given to grouped line redundant positional mooring systems.

1.1.14 The application of the requirements for local scantlings to a column-stabilised unit is shown in Fig. 6.1.1.

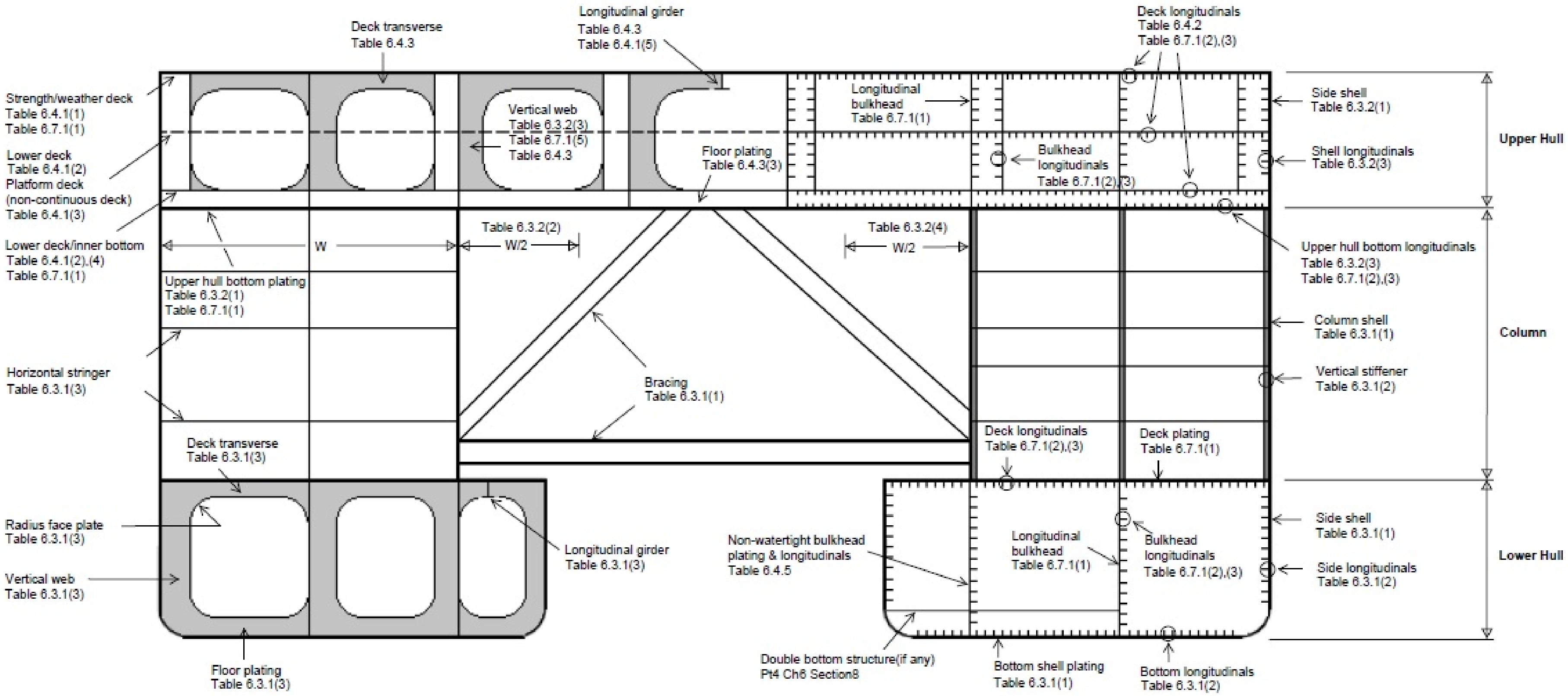


Fig. 6.1.1 Application of the requirements for local scantlings to a column-stabilised unit

Part 4, Chapter 6

Corrigenda

■ *Section 3* **Watertight shell boundaries**

3.4 Buoys and deep draught caissons

(*Part only shown*)
Table 6.3.4 Shell framing self-~~elevting~~ elevating units

(*Part only shown*)
Table 6.3.5 Watertight shell boundaries of buoys and deep ~~drauggh~~ draught caissons

■ *Section 5* **Helicopter landing areas**

5.1 General

5.1.1 This section gives the requirements for deck intended for helicopter operations on all unit types.

5.1.2 Attention is drawn to the requirements of National and other Authorities concerning the construction of helicopter landing platforms and the operation of helicopters as they affect the unit. These include the 2009 IMO MODU Code and SOLAS Chapter II-2 Regulation 18, ~~and Chapter III Regulation 28~~ and CAP 437 7th edition, NMA/NMD 2013 and ISO 19901-3:2011, as applicable. Guidance on the provision and operation of helicopter landing or winching facilities may be drawn from International Standards such as the International Chamber of Shipping (ICS) Guide to Helicopter/Ship Operations and the International Aeronautical Search and Rescue Manual (IAMSAR).

5.1.3 Where helicopter decks are positioned so that they may be subjected to wave impacts, the scantlings are to be considered in a realistic manner and increased to the satisfaction of LR. Calculations are to be submitted for consideration.

5.1.4 Where the landing area forms part of a weather or erection deck, the scantlings are to be not less than those required for decks in the same position.

5.2 Plans and data

5.2.1 Plans and data are to be submitted giving the arrangements, scantlings and details of the helicopter deck. The type, size, weight and footprint ~~and weight~~ of helicopters to be used are also to be indicated.

5.2.2 Relevant details of the largest helicopters, for which the deck is designed, are to be stated in the Operations Manual.

5.3 Arrangements

5.3.1 The landing area is to comply with applicable Regulations, International Standards or is to be to the satisfaction of the National Authority with respect to size, landing and take-off sectors of the helicopter, freedom from height obstructions, deck markings, safety nets and lighting, etc.

5.3.2 The landing area is to have an overall coating of non-slip material or other arrangements are to be provided to minimise the risk of personnel or helicopters sliding off the landing area.

5.3.3 A drainage system is to be provided in association with a perimeter guttering system or slightly raised kerb to prevent spilled fuel falling on to other parts of the unit. The drains are to be led to a safe area.

5.3.4 A sufficient number of tie-down points are to be provided to secure the helicopter.

5.3.5 Engine and boiler uptake arrangements are to be sited such that exhaust gases cannot be drawn into helicopter engine intakes during helicopter take-off or landing operations.

5.4 Design loads

5.4.1 Helideck support structures should be designed to carry all the loads imposed on the helideck through to the primary structure of the unit. Helideck loads derive from the parameters of the helicopter for which the helideck is intended (landing impact forces and wheel spacing), the deck weight, plus environmental loads (wind, snow and ice), and inertial loads due to unit

movement, as applicable. Additionally, the effects of live loads and loads arising from parked helicopters (tied down) should be evaluated.

5.4.2 The designer of the support structure should ensure that all appropriate load cases have been applied to the helideck, and that the resulting maximum load cases are used in the design of the support structure. Similarly, it is important that the load cases are accurately transposed to the design conditions for the primary structure to which the support structure will be connected.

5.5 Load combination

5.5.1 The helicopter landing area is to be considered with respect to design loads resulting from the following conditions:
(a) Emergency landing
(b) Normal operation and
(c) Helicopter at rest

5.5.2 **Emergency landing** The following loads are to be considered in helicopter emergency landing condition.
(a) Helicopter landing dynamic loads: For an emergency landing, an impact load of 2,5 x the maximum take-off weight (MTOW) of the helicopter should be applied in any position on the landing area together with the combined effects of (b) to (g) inclusive.
(b) Structural response factor for supporting structure: The helicopter landing dynamic loads shall be increased by a structural response factor to account for the sympathetic response of the helideck structure. The factor to be applied for the design of the helideck framing depends on the natural frequency of the deck structure. Unless values based upon particular undercarriage behaviour and deck frequency are available, a minimum structural response factor of 1,3 shall be used.
(c) Area loads: A general area-distributed load of 0,5 kN/m^2 shall be applied to allow for minor equipment left on the helideck and for any snow and ice loads.
(d) Horizontal loads as a proportion of MTOW: Concentrated horizontal imposed loads equivalent in total to half the maximum take-off weight of the helicopter shall be applied at the locations of the main undercarriages and distributed in proportion to the vertical loads at each point. These shall be applied at deck level in the horizontal direction that will produce the most severe load case for the structural component being considered.
(e) Self weight of structure and fixed appurtenances: The self weight of the helideck structure and fixed appurtenances supported by each structural component concerned shall be evaluated.
(f) Wind loads: Wind loads on the helideck structure shall be applied in the direction which, together with the horizontal imposed loads, produces the most severe load case for the structural component considered. The wind speed to be considered shall be that restricting normal (non-emergency) helicopter operations at the platform. Any vertical action on the helideck structure due to the passage of wind over and under the helideck shall be considered.
(g) Inertial loads: The effect of accelerations and dynamic amplification arising from the predicted motions of the fixed or floating platform in a storm condition with a 10 year return period shall be considered.

5.5.3 **Normal operations** The following loads are to be considered in helicopter normal operation condition
(a) Helicopter landing dynamic loads: For a normal operation, an impact load of 1,5 x the maximum take-off weight (MTOW) of the helicopter should be applied in any position on the landing area together with the combined effects of (b) to (g) inclusive.
(b) Structural response factor for supporting structure: The helicopter landing dynamic loads shall be increased by a structural response factor to account for the sympathetic response of the helideck structure. The factor to be applied for the design of the helideck framing depends on the natural frequency of the deck structure. Unless values based upon particular undercarriage behaviour and deck frequency are available, a minimum structural response factor of 1,3 shall be used.
(c) Area loads: To allow for personnel, freight, refuelling equipment and other traffic, snow and ice, rotor downwash, etc., a general area load of 0,5 kN/m^2 shall be included.
(d) Horizontal loads as proportion of MTOW: Concentrated horizontal imposed loads equivalent in total to half the maximum take-off weight of the helicopter shall be applied at the locations of the main undercarriages and distributed in proportion to the vertical loads at each point. These shall be applied at deck level in the horizontal direction that will produce the most severe load case for the structural component being considered.
(e) Self weight of structure and fixed appurtenances.
(f) Wind loads: The 100 year return period wind loads on the helideck structure shall be applied in the direction which produces the most severe load case for the structural component considered.
(g) Inertial loads: The effect of accelerations and dynamic amplification arising from the predicted motions of the fixed or floating platform in a storm condition with a 10 year return period shall be considered.

5.5.4 **Helicopter at rest** The following loads are to be considered in helicopter at rest condition
(a) Helicopter static loads (local patch loads on landing gear): All parts of the helideck accessible to helicopters shall be designed to support a load equal to the MTOW of the helicopter at any location. This shall be distributed at the undercarriage locations in proportion to the position of the centre of gravity of the helicopter, taking account of possible different positions and orientations of the helicopter.
(b) Area loads: To allow for personnel, freight, refuelling equipment and other traffic, snow and ice, rotor downwash, etc., a general area load of 2,0 kN/m^2 shall be included.
(c) Horizontal loads from tie down helicopter, including wind loads from a secured helicopter: Each tie-down shall be designed to resist the calculated proportion of the total wind action on the helicopter imposed by a storm wind with a minimum one year return period.
(d) Self weight of structure and fixed appurtenances.
(e) Wind loads: The 100 year return period wind loads on the helideck structure shall be applied in the direction which produces the most severe load case for the structural component considered.

(f) Inertial loads: The effect of accelerations and dynamic amplification arising from the predicted motions of the fixed or floating platform in a storm condition with a 10 year return period shall be considered.

5.5.5 Deck plate and stiffeners shall be designed to limit the permanent deflection (deformation) under helicopter emergency landing conditions to no more than 2,5 % of the clear width of the plates between supports.

~~5.4~~ 5.6 Landing area plating

~~5.4.1~~ 5.6.1 The deck gross plate thickness, t, within the landing area is to be not less than:

$$t = t_1 + 1{,}5 \text{ mm}$$

where

$$t_1 = \frac{\alpha s}{1000\sqrt{k}} \text{ mm}$$

α = thickness coefficient obtained from Fig. 6.5.1

β = tyre print coefficient used in Fig. 6.5.1

$$= \log 10 \left(\frac{P_1 k^2}{s^2} \times 10^7 \right)$$

The plating is to be designed for the emergency landing case taking:

$P1 = 2{,}5 \phi 1 \ \phi 2 \ \phi 3 \ f \ \gamma$ Pw tonnes

where

$\phi 1$, $\phi 2$, $\phi 3$ are to be determined from Table 6.5.3

f = 1,15 for landing decks over manned spaces, e.g., deckhouses, bridges, control rooms, etc.
= 1,0 elsewhere

Ph = the maximum all up weight of the helicopter, in tonnes

Pw = landing load on the tyre print, in tonnes;
For helicopters with a single main rotor, Pw, is to be taken as Ph divided equally between the two main undercarriage wheels.
For helicopters with tandem main rotors, Pw, is to be taken as Ph distributed between all main undercarriage wheels in proportion to the static loads they carry.
For helicopters fitted with landing gear consisting of skids, Pw is to be taken as Ph distributed in accordance with the actual load distribution given by the airframe manufacturer. If this is unknown, Pw is to be taken as 1/6 Ph for each of the two forward contact points and 1/3 Ph for each of the two aft contact points. The load may be assumed to act as a 300 mm x 10 mm line load at each end of each skid when applying Fig. 6.5.1.

γ = 0,6 generally. Factor to be specially considered where the helicopter deck contributed to the overall strength of the unit.

Other symbols used in this Section are defined in Section 6 and in the appropriate sub-Section.

For wheeled undercarriages, the tyre print dimensions specified by the manufacturer are to be used for the calculation. Where these are unknown, it may be assumed that the print area is 300 x 300 mm and this assumption is to be indicated on the submitted plans. For skids and tyres with an asymmetric print, the print is to be considered oriented both parallel and perpendicular to the longest edge of the plate panel and the greatest corresponding value of α taken from Fig. 6.5.1.

~~5.4.2~~ 5.6.2 The plate thickness for aluminium decks is to be not less than:

$t = 1{,}4 t1 + 1{,}5$ mm

where

t1 is the mild steel thickness as determined from ~~5.4.1~~ 5.6.1.

Where the deck is fabricated using extruded sections with closely spaced stiffeners the plate thickness may be determined by direct calculations but the minimum deck thickness is to include 1,5 mm wear allowance. If the deck is protected by closely spaced grip/wear treads the wear allowance may be omitted.

~~5.5~~ 5.7 Deck stiffening and supporting structure

~~5.5.1~~ 5.7.1 The helicopter deck stiffening and the supporting structure for helicopter decks are to be designed for the load cases given in Table 6.5.1 in association with the permissible stresses given in Table 6.5.2. The helicopter is to be positioned so as to produce the most severe loading condition for each structural member under consideration.

~~5.5.2~~ 5.7.2 In addition to the requirements of ~~5.5.1~~5.7.1, the structure supporting helicopter decks is to be designed to withstand the loads imposed on the structure due to the motions of the unit. For self-elevating units, the motions are not to be less than those defined for transit conditions in Ch 4,3.10 and 3.11. The stress levels are to comply with load case 3 in Table 6.5.2, *see also* 5.1.3.

~~*5.5.3*~~ *5.7.3* For load cases (1) and (2) in Table 6.5.1 the minimum moment of inertia, I, of aluminium alloy secondary structure stiffening is to be not less than:

$$I = \frac{5{,}25}{k_a} Z\, l_e \text{ cm}^4$$

Where Z is the required section modulus of the aluminium alloy stiffener and attached plating and ka as defined in Ch 2,1.3.

~~*5.5.4*~~ *5.7.4* Where a grillage arrangement is adopted for the platform stiffening, it is recommended that direct calculation procedures be used.

~~*5.5.5*~~ *5.7.5* When the deck is constructed of extruded aluminium alloy sections, the scantlings will be specially considered on the basis of this Section.

~~5.6 Stowed helicopters~~

~~*5.6.1* In addition to the requirements of 5.4 and 5.5, when arrangements are made to stow helicopters secured to the deck in predetermined positions, the structure is to be designed for the local loadings which can occur during normal operations.~~

~~*5.6.2* Local loads on the structure are to be based on the maximum design undercarriage loadings specified by the helicopter manufacturer multiplied by a dynamic amplification factor based on the predicted motions of the unit as applicable. The self weight of the helicopter deck is to be included in the loadings imposed on the primary support structure. The permissible stress levels are to be in accordance with load case 3 in Table 6.5.2.~~

~~*5.6.3* When the minimum design air temperature of the unit is 0°C or below, and considering the loadings in 5.6.2, the helicopter deck is to be assumed loaded with a uniformly distributed load of 0,5 kN/m² (0,05 tonne-f/m²) to represent wet snow or ice.~~

~~5.7~~ 5.8 Bimetallic connections

~~*5.7.1*~~ *5.8.1* Where aluminium alloy platforms are connected to steel structures, details of the arrangements in way of the bimetallic connections are to be submitted.

~~Table 6.5.1 Design load cases for deck stiffening and supporting structure~~

~~Load cases~~	~~Load~~			
	~~Landing area~~		~~Supporting structure *See* Note 1~~	
	~~*UDL*,~~ in kN/m^2	~~Helicopter patch load *See* Note 2~~	~~Self-weight~~	~~Horizontal load *See* Note 2~~
~~(1) Overall distributed loading~~	~~2~~	~~-~~	~~-~~	~~-~~
~~(2) Helicopter emergency landing~~	~~0,5~~	~~2,5Pwf~~	~~Wh~~	~~0,5Ph~~
~~(3) Normal usage~~	~~0,5~~	~~1,5Pw~~	~~Wh~~	~~0,5Ph + 0,5Wh~~

~~Symbols~~

~~Ph, Pw and f as defined in 5.6.1~~
~~UDL = uniformly distributed vertical load over entire landing area~~
~~Wh = structural self-weight of helicopter platform~~

~~NOTES~~
~~1. For the design of the supporting structure for helicopter platforms applicable self-weight and horizontal loads are to be added to the landing area loads.~~
~~2. The helicopter is to be so positioned as to produce the most severe loading condition for each structural member under consideration.~~

Table 6.5.1 Design load cases for deck stiffening and supporting structure

Load cases	Load					
	Landing area		Supporting structure *See* Note 1			
	Area load, in kN/m^2	Helicopter patch load *See* Note 2	Horizontal load *See* Note 2	Self-weight	Wind load, return period in years	Inertia load, return period in years
(1) Helicopter emergency landing	0,5	2,5Pwf	0,5Ph	Wh	*See* 5.5.2 (f)	10
(2) Normal operation	0,5	1,5Pwf	0,5Ph	Wh	100)	10
(3) Helicopter at rest	2,0	Pw	*See* 5.5.4 (c)	Wh	100	10
Symbols						
Ph, Pw and f as defined in 5.6.1 Wh = structural self-weight of helicopter platform						
NOTES 1. For the design of the supporting structure for helicopter platforms applicable horizontal load, self-weight, wind load and inertia load are to be added to the landing area loads. 2. The helicopter is to be so positioned as to produce the most severe loading condition for each structural member under consideration. 3. For the emergency landing and normal operation, helicopter patch load shall be increased by a suitable structural response factor depending upon the natural frequency of the helideck structure. It is recommended that a structural response factor of 1,3 should be used unless further information allows a lower factor to be calculated.						

Table 6.5.2 Permissible stresses for deck stiffening and supporting structure

Load case *See* Table 6.5.1	Permissible stresses, in N/mm^2			
	Deck secondary structure (beams, longitudinals, deck plating *See* Notes 1 and 2)	Primary structure (transverse, girders, pillars, trusses)		All structure
	Bending		Combined bending and axial	Shear
~~(1) Overall distributed loading~~	~~147/k~~	~~147/k~~	~~0,6 σ_e~~	
(1) Helicopter emergency landing	245/k	220,5/k	0,9 σ_c	$\frac{\text{Bending}}{\sqrt{3}}$ -
(2) Normal ~~usage~~ operation	176/k	147/k	0,6 σ_c	
(3) Helicopter at rest	176/k	147/k	0,6 σ_c	
Symbols				
k = a material factor: = as defined in Ch 2,1.2 for steel members = k_a as defined in Ch 2,1.3 for aluminium alloy members σ_c = yield stress, 0,2% proof stress or critical compressive buckling stress, in N/mm^2, whichever is the lesser				
NOTES 1. Lower permissible stress levels may be required where helideck girders and stiffening contribute to the overall strength of the unit. Special consideration will be given to such cases. 2. When determining bending stresses in secondary structure, for compliance with the above permissible stresses, 100% end fixity may be assumed.				

■ *Section 7*
Bulkheads

7.3 Watertight and deep tank bulkheads

7.3.1 The scantlings of watertight and deep tank bulkheads are to comply with the requirements of Tables 6.7.1 to 6.7.3. Where tanks cannot be inspected at normal periodic surveys, the scantlings derived from this Section are to be suitably increased. All tanks are to be considered as deep tanks.

Part 4, Chapter 8

Welding and Structural Details

Effective date 1 July 2015

■ *Section 2* **Welding**

2.4 Fillet welds

(*Part only shown*)
Table 8.2.3 Additional weld factors

Item	Weld factor	Remarks
(6) Miscellaneous structures, fittings and equipment:		
(t) supports for risers, umbilicals and caissons	0,44	full penetration welding may be required

■ *Section 6* **Fabrication tolerances**

6.1 General

6.1.5 The misalignment of plate edges in butt welds is not to exceed the lesser of the following values:
• Special structure 0,1*t* or 3 mm
• Primary structure 0,15*t* or 3 mm
• Secondary structure 0,2*t* or 4 mm
where
t = thickness of the thinnest plate, in mm.
See Fig. 8.6.1.

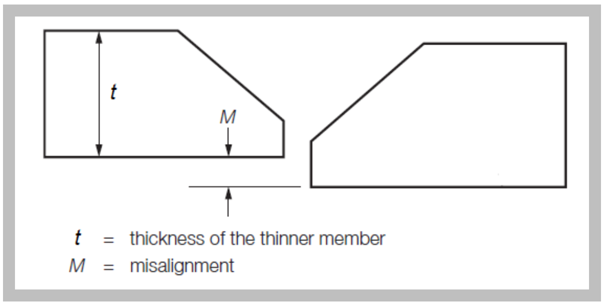
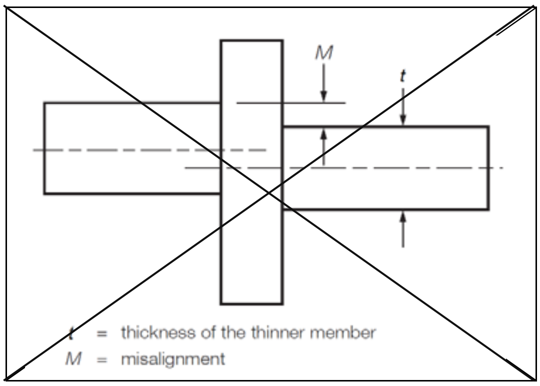


Fig. 8.6.1 Misalignment of plate edges in butt welds

6.1.6 Misalignment of non-continuous plates such as cruciform joints is not to exceed the lesser of the following values:
• Special structure 0,2*t* or 4 mm
• Primary structure 0,3*t* or 4 mm
• Secondary structure 0,5*t* or 5 mm
where
t = thickness of the thinnest plate, in mm.
See Fig. 8.6.2.



~~Fig. 8.6.2 Misalignment of non-continuous plates~~

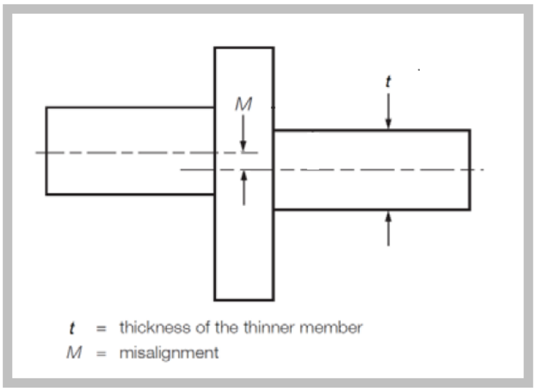
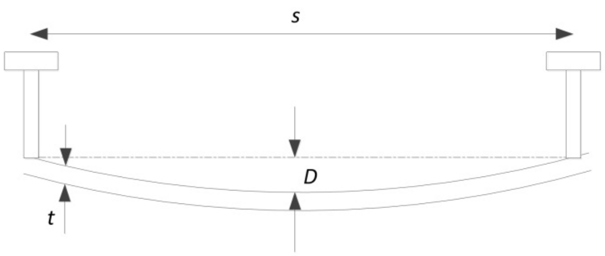


Fig. 8.6.2 Misalignment of non-continuous plates

6.1.7 Plate deformation measured at the mid-point between stiffeners or support points is not to exceed the lesser of the following values:

- Special structure $\frac{s}{200}$ mm
- Primary structure $\frac{s}{130}$ or t mm
- Secondary structure $\frac{s}{80}$ or t mm

where
s = stiffener spacing or unsupported panel width, in mm
t = plate thickness, in mm.
See Fig. 8.6.3.



t = plate thickness
s = stiffener spacing or unsupported panel width
D = deformation at the mid-point between stiffeners or support points

Fig 8.6.3 Plate deformation

Cross-References

Section numbering in brackets reflects any Section renumbering necessitated by any of the Notices that update the current version of the Rules for Offshore Units.

Part 4, Chapter 6

5.4.2	Reference to Part 4, Chapter 6, 5.4.1 now reads Part 4, Chapter 6, 5.6.1
Table 6.5.1	Reference to Part 4, Chapter 6, 5.4.1 now reads Part 4, Chapter 6, 5.6.1

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